

APPROACHES FOR ASSESSING HOMELESS CONTRIBUTIONS TO BACTERIAL CONTAMINATION

Presentation to the Water Quality Coordinating Committee

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BACKGROUND

- **Bacterial water quality impairment from homeless fecal deposits is a potential problem**
 - Orange County Public Works removed 5,279 lbs of human fecal matter when they conducted their Santa Ana River cleanup effort
 - Human fecal material contains more pathogens of concern than other sources
- **There is a long way from “potential” to “problem”**
 - Don’t know how much homeless contributions end up in the river
 - There have been no definitive studies quantifying bacterial load from homeless
- **The scientific tools to help quantify the problem are evolving**

THE CHANGING MANAGEMENT QUESTION

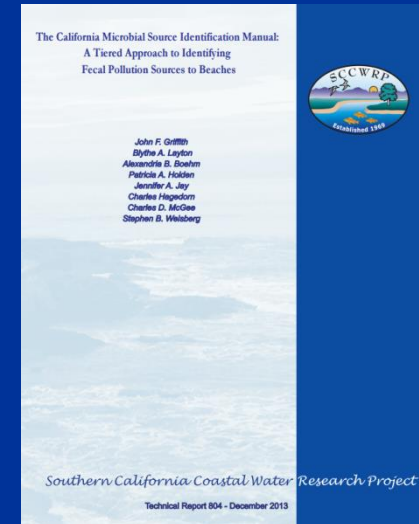
- Initial question was: “Is there a bacterial problem”?
- Next question: “How much of our bacterial problem is attributable to human fecal sources?”
- Question now: “How much of the human fecal contribution can be attributed to different sources?”
 - Private sewer laterals and septics
 - Public sewerage conveyance systems
 - Homeless
- Scientists are working on new techniques that will help answer the last question

IS THERE A BACTERIAL PROBLEM?

- **Enterococcus and fecal coliforms are your core indicators**
 - Not pathogenic themselves, but occur abundantly in the human gut
 - Epidemiological studies have shown their presence correlates with human illness
 - These are incorporated in your recently adopted bacterial provisions
- **In wet weather, these indicator bacteria widely exceed objectives, regardless of location**
- **However, these indicators are of limited value for assessing homeless contributions**
 - They don't differentiate human from animal fecal material
 - Could potentially do upstream-downstream studies, but they haven't been done
 - Could potential do a mass loading comparison, but many assumptions

HOW MUCH IS ATTRIBUTABLE TO HUMAN SOURCES?

- **Next step - Scientists identified a series of genetic markers that differentiate human from non-human sources (HF183)**
 - Also identified markers for dog, gull, cow and horse feces
- **Enhances opportunity for identifying potential fecal sources**
 - Tremendous boon to TMDL planning
 - Also useful for prioritizing which locations to clean
- **However, we frequently find human fecal markers in stormwater systems**
 - HF183 is of no help in differentiating among human sources



California Microbial Source
Identification Manual

COMMUNITY PROFILING

- **New approach is microbial community profiling**
 - Don't look for a specific genetic marker
 - Instead look for a community signature
- **Based on the concept that a unique microbial community grows on biofilms inside sewer pipes**
- **If sewer microbial community found in runoff, then sewer contributions likely**
- **If not found in runoff, then another human source is responsible**

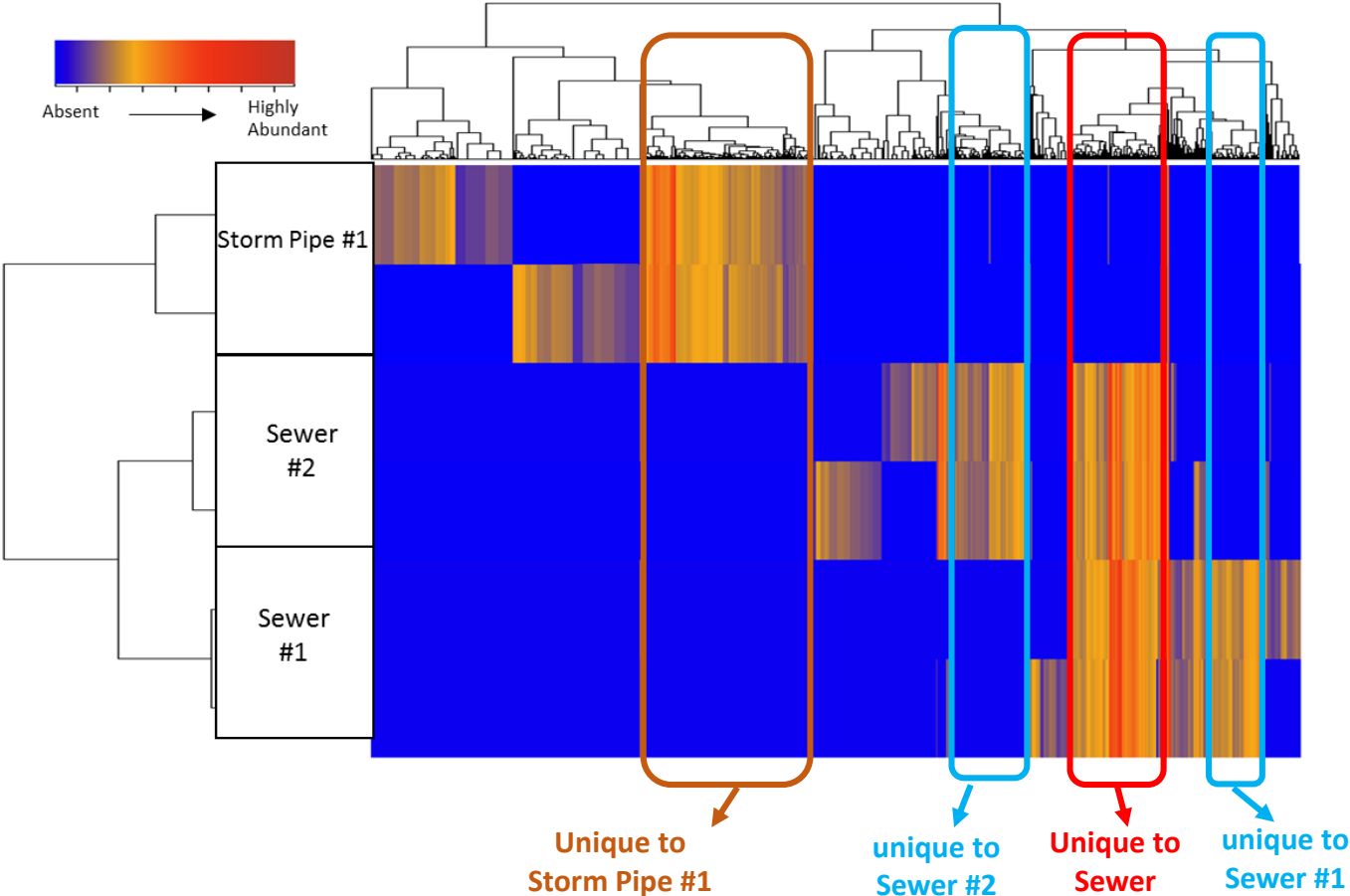


STUDIES ARE UNDERWAY

- **Sample many locations to evaluate spatial consistency**
 - Sewerage system with different source inputs (e.g. residential vs. industrial)
 - Age of pipe
 - Pipe construction materials
- **Sample over time to evaluate temporal consistency**
 - Seasonality
 - Biofilm regrowth
- **Initial results are extremely promising!**



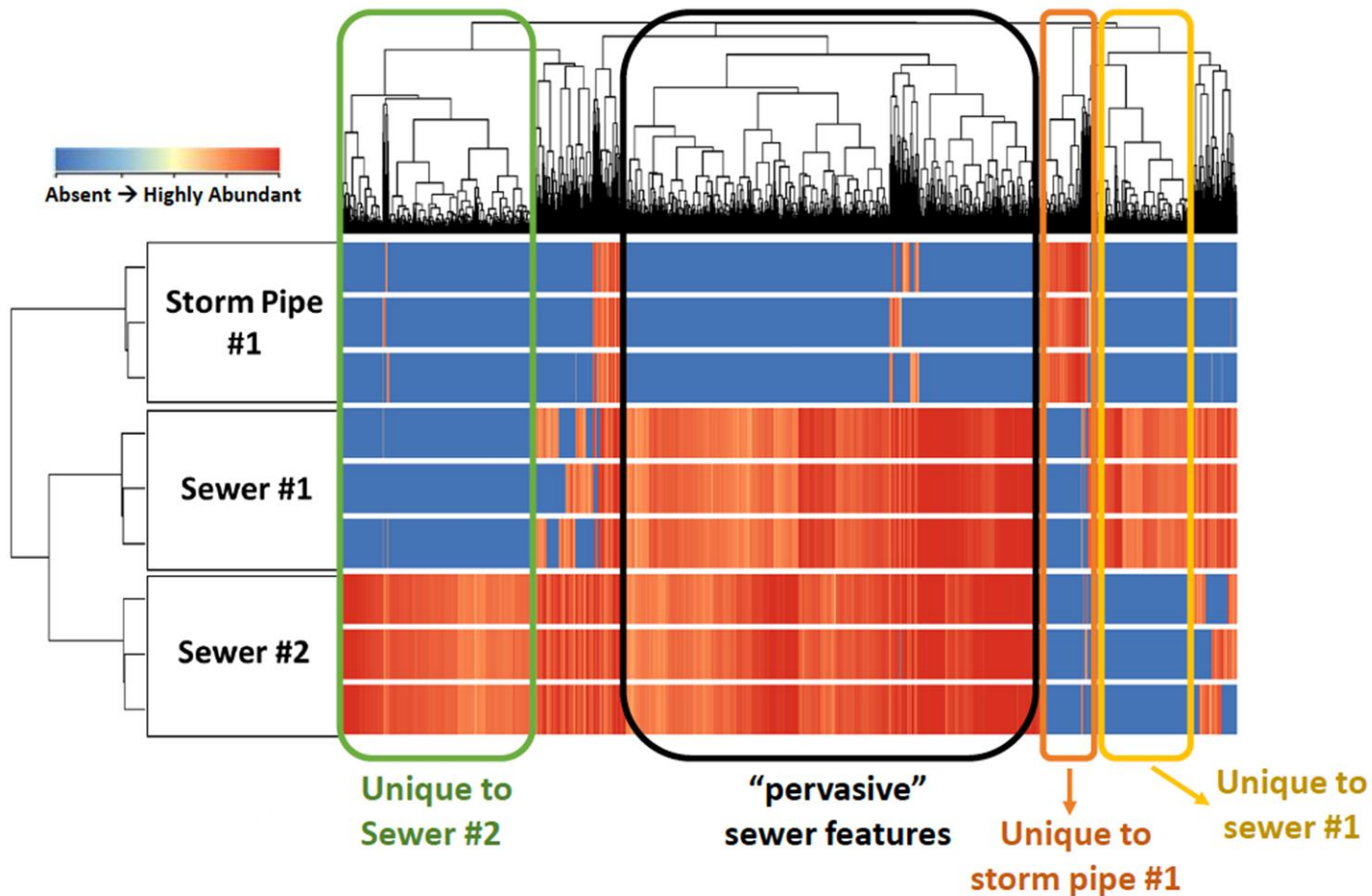
Preliminary Results: Microbial Community Analysis



MOVING FORWARD

- **Studies this winter to further confirm that microbial communities differ between sanitary sewer and storm drains**
 - We will be quantifying this at about 60 sites over the next year
- **Will also be studying persistence and sensitivity**
 - Not much value if the signal degrades quickly
 - Also not of much value if we can't measure it after dilution
- **San Diego as a case study for how to use the outcome**
 - Study is a collaboration among the Regional Board, City and County
 - Not yet focused on developing similar signatures for homeless or septic
 - However, will be a big advance if we can confirm or eliminate sewer conveyance system leakage as a dominant source

Initial Results: Non-targeted Chemistry



DATA NECESSARY FOR ESTIMATING HOMELESS CONTRIBUTIONS

- **Number of homeless**
 - Locations and times
- **Quantify the sanitary habits**
 - Directly into the river
 - Indirectly into the river (upland or on riverbanks)
 - Offsite services provided by the cities
- **Washoff experiments for upland or riverbank deposits**